CLAIMS

What Is Claimed Is:

1. A hearing aid comprising:

a microphone operable to sense acoustical events and convert them to proportionate electrical signals;

a variable gain amplifier operable to amplify the electrical signals from the microphone and provide an amplified output of that signal depending on the gain of the amplifier;

a difference amplifier operable to adjust the gain of the variable gain amplifier;

a long-term energy averaging circuit operable to sense substantially steady state acoustical events received by the microphone and force the difference amplifier to reduce the gain of the variable gain amplifier in view of the steady state signals;

a short-term energy averaging circuit operable to sense novel acoustical signals received by the microphone and force the difference amplifier to increase the gain of the variable gain amplifier in view of the novel signals; and

an earphone operable to receive an output signal from the variable gain amplifier and convert it to an audible sound.

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2. The hearing aid according to Claim 1 further comprising a plurality of amplification channels in which each amplification channel includes a bandpass filter operable to set a frequency band range of the particular amplification channel, wherein each amplification channel further includes a separate variable gain amplifier, short-term energy averaging circuit, long-term energy averaging circuit and difference amplifier ~~operating in a similar manner~~.

3. The hearing aid according to Claim 2 in which an output from each of the plurality of amplification channels is applied to a summing amplifier, said summing amplifier being operable to apply a summed signal to the earphone.

~~4. The hearing aid according to Claim 1 wherein each~~ of the long-term energy averaging circuit and the short-term energy averaging circuit are integrating circuits, wherein the long-term energy averaging circuit integrates electrical signals having a power spectrum which does not change significantly over time and the short-term energy averaging circuit integrates signals which do have a power spectrum which significantly ~~changes over time.~~

5. The hearing aid according to Claim 1 further comprising an automatic gain control circuit operable to limit the output of the hearing aid below a predetermined intensity.

6. The hearing aid according to Claim 1 wherein the difference amplifier includes a first weighting amplifier and a second weighting amplifier, said first weighting amplifier being a positively weighted amplifier for applying a positively weighted signal from the short-term energy averaging circuit to a summation junction and said second weighting amplifier being a negative weighting amplifier for providing an inverse signal from the long-term energy averaging circuit to the summation junction.

7. The hearing aid according to Claim 6 wherein the difference amplifier further includes a sigmoidal transfer function circuit for providing a saturable gain limitation to the output of the difference amplifier.

8. An amplifying circuit comprising:

a variable gain amplifier receiving an input signal and providing an amplified output of the input signal depending on the gain of the amplifier;

a difference amplifier having an output which adjusts the gain of the variable gain amplifier;

a long-term energy averaging circuit applying an input signal to a negative input of the difference amplifier for decreasing the gain of the variable gain amplifier, said long-term energy averaging circuit integrating substantially steady state signals of the input signal; and

a short-term energy averaging circuit applying an input signal to a positive input of the difference amplifier for increasing the gain of the variable gain amplifier, said short-term energy averaging circuit integrating novel signals of the input signal.

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9. The ~~amplification~~ amplifying circuit according to Claim 8 wherein the amplification circuit is associated with a hearing aid device, wherein the hearing aid device includes a microphone which senses acoustical events from the environment and converts them to electrical signals and applies the electrical signals as the input signal to the variable gain amplifier, said hearing aid further including an earphone which receives an output from the variable gain amplifier and converts it to an audible sound to be perceived by a hearing aid user.

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10. The ~~amplification~~ amplifying circuit according to Claim 8 further comprising a bandpass filter, said band pass filter limiting the input to the variable gain amplifier to a predetermined frequency range.

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~~11. The amplification circuit according to Claim 8~~ wherein each of the long-term energy averaging circuit and the short-term energy averaging circuit are integrating circuits, wherein the long-term energy averaging circuit integrates electrical signals having a power spectrum which does not change significantly over time and the short-term energy averaging circuit integrates signals which do have a power spectrum which ~~significantly changes over time.~~

12. The amplifying ~~amplification~~ circuit according to Claim 8 wherein the difference amplifier includes a first weighting amplifier and a second weighting amplifier, said first weighting amplifier being a positively weighted amplifier for applying a positively weighted signal from the short-term energy averaging circuit to a summation junction and said second weighting amplifier being a negative weighting amplifier for providing an inverse signal from the long-term energy averaging circuit to the summation junction.

13. A method of amplifying an acoustical event, said method comprising the steps of:

converting the acoustical event to a proportionate electrical signal:

applying the electrical signal as an input to a variable gain amplifier in order to amplify the signal depending on the gain of the amplifier;

applying an output from a difference amplifier to the variable gain amplifier in order to adjust the gain of the variable gain amplifier;

applying an output from a long-term energy averaging circuit to a negative input of the difference amplifier, wherein the long-term energy averaging circuit senses steady state portions of the signal in order to force the difference amplifier to reduce the gain of the variable gain amplifier;

applying an output from a short-term energy averaging circuit to a positive input of the difference amplifier, wherein the short-term energy averaging circuit integrates novel portions of the signal in order to force the difference amplifier to increase the gain of the variable gain amplifier; and

converting an output of the variable gain amplifier to a proportionate acoustical signal.

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14. The method according to Claim 13 wherein the step of converting the acoustical event to an electrical signal includes using a microphone to sense the acoustical events and convert them to the electrical signals.

15. The method according to Claim 13 wherein the step of converting the output of the variable gain amplifier includes using an earphone to convert the output from the variable gain amplifier to an audible sound.

16. The method according to Claim 13 further comprising the step of applying the converted electrical signal to a plurality of channels, each of the channels including a band pass filter for limiting the frequencies of each channel to a particular frequency range, each channel further including a variable gain amplifier, a difference amplifier, a short-term energy averaging circuit, and a long-term energy averaging circuit.

A 17. The method according to Claim ~~13~~ 16 further comprising the step of applying an output from each of the channels to a summing junction prior to the electrical signals being converted to the acoustical signal.

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18. The method according to Claim 13 further comprising the step of applying the electrical signal to an automatic gain control circuit for limiting the output intensity of the signal.

~~19. The method according to Claim 13 wherein the long-term energy averaging circuit integrates electrical signals having a power spectrum which does not significantly change over time and the short-term energy averaging circuit integrates signals which do have a power spectrum which changes over time.~~